

change to a frame in a video layer to a small number of frames in the same video layer forwards or backwards in time from the changed frame, this conventional video editing technique is likewise very laborious and time consuming.

5

SUMMARY OF THE INVENTION

[7] An object of the invention is to provide a system to edit video efficiently.

[8] A further object of the invention is to provide a system to edit video faster than with conventional techniques.

[9] An additional object of the invention is to provide a system to obtain edited video having greater realism than edited video obtained with conventional techniques.

[10] Another object of the invention is to provide a system that permits editing a video sequence without editing each frame individually.

[11] Another additional object of the invention is to provide a video coloring book.

[12] The invention includes a method, a system, an apparatus, and an article of manufacture for video editing.

[13] The article of manufacture of the invention includes a computer-readable medium having software for editing a decomposed original video sequence. The decomposed original video sequence comprises one or more original camera-motion layers and zero or more original fixed-frame layers decomposed from an original video sequence. The software comprises code segments for editing at least one of the original camera-motion layers to obtain modified camera-motion layers such that each frame of a composite modified video sequence composed from the modified camera-motion layers and the original fixed-frame layers is obtained without editing each frame of the original video sequence. The editing comprises performing an edge operation

to one of said original camera-motion layers. The computer-readable medium further comprises code segments for editing at least one of the original fixed-frame layers to obtain modified fixed-frame layers.

[14] The apparatus of the invention includes an apparatus for editing an original video sequence comprising: an object-based video encoder to decompose the original video sequence into a decomposed original video sequence, the decomposed original video sequence comprising one or more original camera-motion layers and zero or more original fixed-frame layers; a video editor to perform an edge operation to one of the original camera-motion layers and to edit the edge operated original camera-motion layers to obtain a decomposed modified video sequence; and an object-based video compositor to compose the decomposed modified video sequence to obtain a composite modified video sequence, wherein each frame of the composite modified video sequence is obtained without editing each frame of the original video sequence.

[15] The method of the invention includes steps in accordance with the invention.

[16] The system of the invention includes a computer system comprising a computer-readable medium having software to operate a computer in accordance with the invention.

[17] The apparatus of the invention includes a computer comprising a computer-readable medium having software to operate the computer in accordance with the invention.

[18] The article of manufacture of the invention includes a computer-readable medium having software to operate a computer in accordance with the invention.

[19] Moreover, the above objects and advantages of the invention are illustrative, and not exhaustive, of those that can be achieved by the invention. Thus, these and other objects and advantages of the invention will be apparent from the description herein, both as embodied

herein and as modified in view of any variations which will be apparent to those skilled in the art.

Definitions

5 [20] A "video" refers to motion pictures represented in analog and/or digital form.

Examples of video include: television, movies, image sequences from a video camera or other observer, and computer-generated image sequences.

[21] A "frame" refers to a particular image or other discrete unit within a video.

10 [22] A "computer" refers to any apparatus that is capable of accepting a structured input, processing the structured input according to prescribed rules, and producing results of the processing as output. Examples of a computer include: a computer; a general purpose computer; a supercomputer; a mainframe; a super mini-computer; a mini-computer; a workstation; a micro-computer; a server; an interactive television; a hybrid combination of a computer and an interactive television; and application-specific hardware to emulate a computer and/or software.

15 A computer can have a single processor or multiple processors, which can operate in parallel and/or not in parallel. A computer also refers to two or more computers connected together via a network for transmitting or receiving information between the computers. An example of such a computer includes a distributed computer system for processing information via computers linked by a network.

20 [23] A "computer-readable medium" refers to any storage device used for storing data accessible by a computer. Examples of a computer-readable medium include: a magnetic hard disk; a floppy disk; an optical disk, such as a CD-ROM and a DVD; a magnetic tape; a memory